Interreg
Danube Transnational Programme
D-STIR

D-STIR Context Analysis

D.3.1.1

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Sources:

- Eurostat - Research & Development; World Bank database; Global Competitiveness Report 2016-2017; Human Development Report 2016; European Innovation Scoreboard
- D-STIR WP4 FHRIA Evaluation of the WP4 Input Template; D-STIR WP4 FHRIA Analysis of the WP4 Input Template; D-STIR WP3 FHRIA Overview of the Danube Territorial Context; D-STIR WP3 ADRSE Partner Input Template
- Project partners input

When a truth is necessary, the reason for it can be found by analysis, that is, by resolving it into simpler ideas and truths until the primary ones are reached (Gottfried Leibniz)

1. Statistical indicators of the Danube region

1.1 Raw data

Bosnia & Herz.	0.30%
Croatia	0.85%
Czechia	1.95%
Germany	2.87%
Hungary	1.38%
Romania	0.49%
Slovakia	1.18%
Slovenia	2.21%

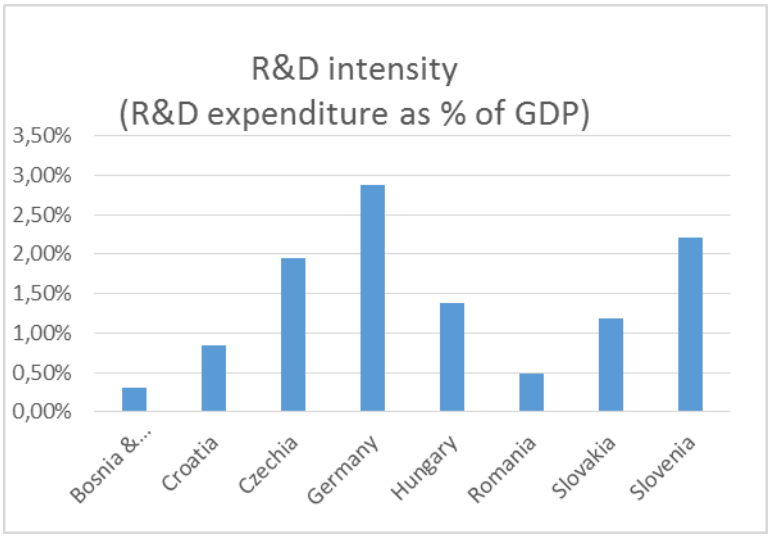


Table 1 and Chart 1: ADRSE construction, using data provided by partners

Bosnia & Herz.	31.30
Croatia	375.00
Czechia	325.00
Germany	87,188.00
Hungary	1,511.00
Romania	782.00
Slovakia	927.00
Slovenia	853.00

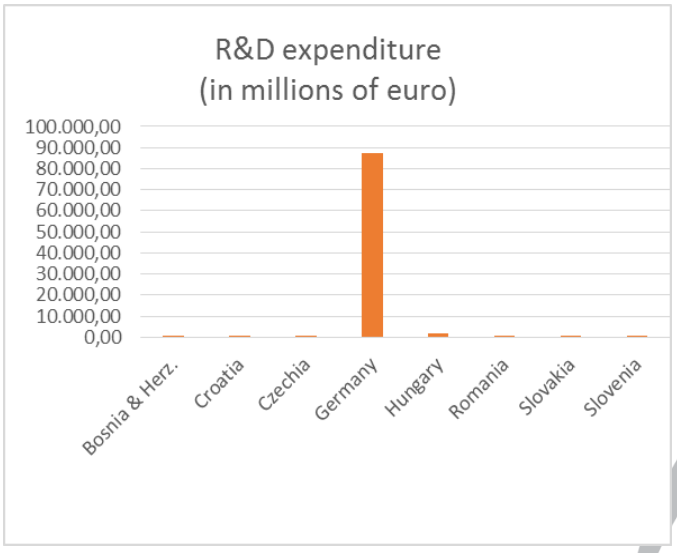


Table 2 and Chart 2: ADRSE construction, using data provided by partners

In Germany, because of the large GDP, the high R&D intensity triggers a very large (unrivaled) R&D expenditure. In Slovenia, Czechia, Hungary, Slovakia, even if the Intensity is high, because of the lower (lower than Germany) GDP, the result (R&D expenditure) is modest in comparison with Germany.

	Business enterprise	Government	Higher education	Private non-profit
Bosnia & Herz.	33%	20%	46%	1%
Croatia	51%	25%	24%	0%
Czechia	54%	21%	25%	0%
Germany	68%	15%	17%	0%
Hungary	75%	13%	12%	0%
Romania	44%	39%	17%	0%
Slovakia	28%	28%	44%	0%
Slovenia	76%	14%	10%	0%

Table 3: ADRSE construction, using data provided by partners

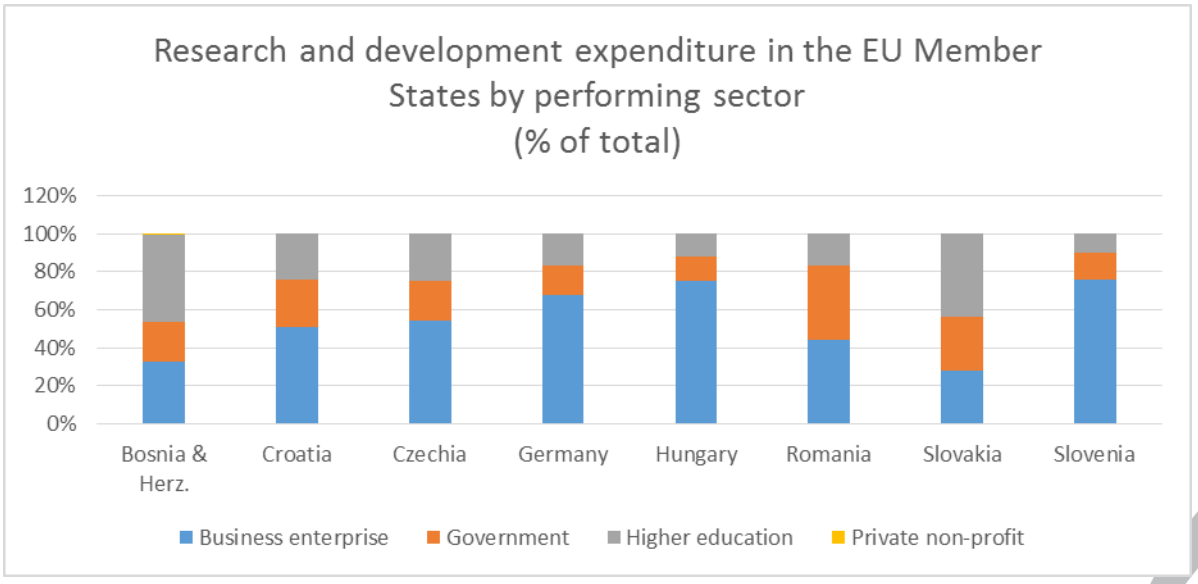


Chart 3: ADRSE construction, using data provided by partners

Country level comparison: Slovenia is the 1st in „Business enterprise" and the last in „Higher education", Romania focuses on R&D in „Goverment", Bosnia & Herzegovina is the 1st in „Higher education" and the only contry that spends over 1% for „Private non-profit". Internal comparison (own categories): Slovenia focuses the most on „Business enterprise", Romania focuses the most on „Business enterprise", Bosnia & Herzegovina focuses the most on R&D in „Higher education".

	Researchers in R&D
Bosnia & Herz.	781.40
Croatia	1,437.30
Czechia	3,418.46
Germany	2,812.00
Hungary	2,650.60
Romania	921.51
Slovakia	1,863.00
Slovenia	4,149.00

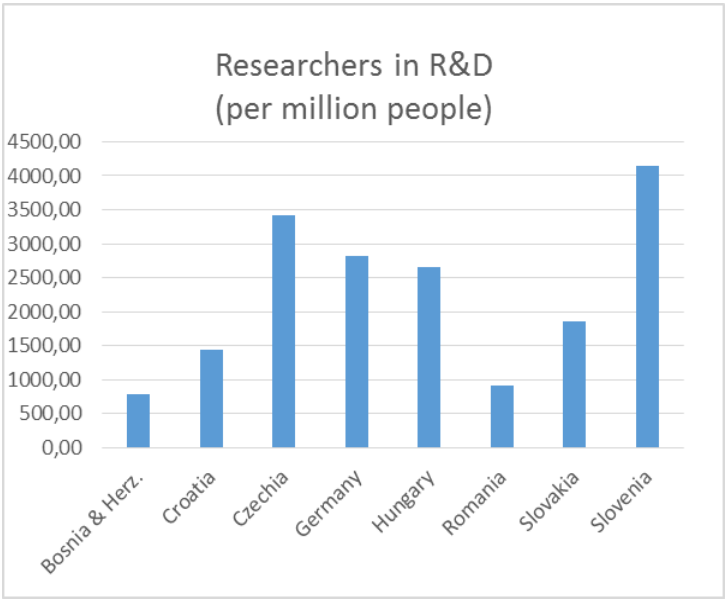


Table 4 and Chart 4: ADRSE construction, using data provided by partners

	Technicians in R&D
Bosnia & Herz.	513.40
Croatia	676.50
Czechia	1,882.43
Germany	1,345.00
Hungary	691.00
Romania	229.50
Slovakia	367.00
Slovenia	2,394.00

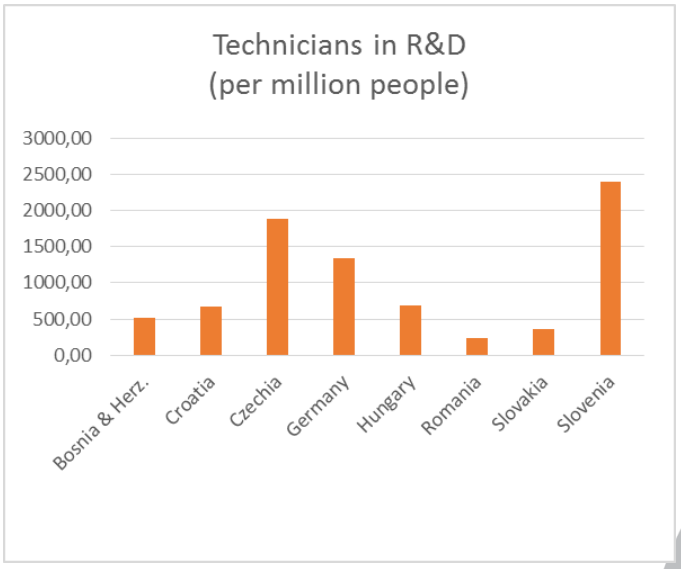


Table 5 and Chart 5: ADRSE construction, using data provided by partners

Slovenia is the champion in both categories (R&D researchers & technicians), Czechia is the second, Germany is the third (even is the R&D intensity & expenditure is the highest) and Hungary is the take the forth place. Bosnia & Herzegovina has the last place in „Researchers in R&D" category and Romania has the last place in „Technicians in R&D" category.

	Patent applications
Bosnia & Herz.	54.00
Croatia	169.00
Czechia	880.00
Germany	47,384.00
Hungary	569.00
Romania	975.00
Slovakia	228.00
Slovenia	470.00

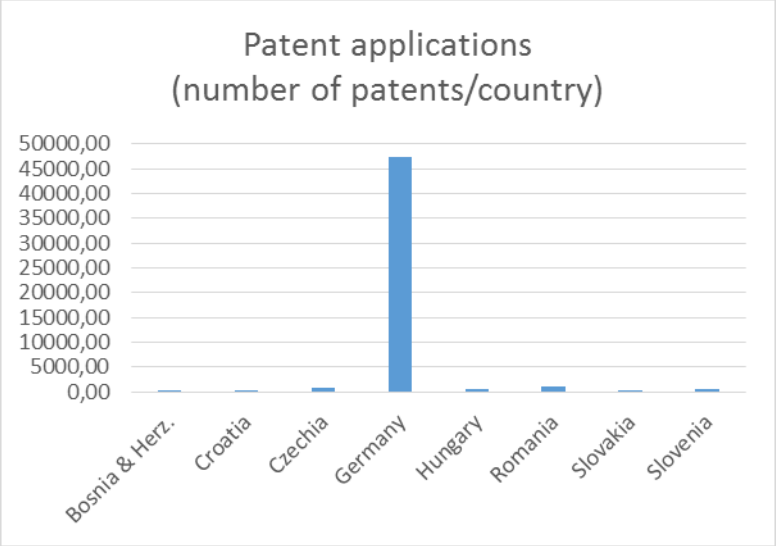


Table 6 and Chart 6: ADRSE construction, using data provided by partners

	Scientific technical journal articles
Bosnia & Herz.	1,481.00
Croatia	0.00
Czechia	14,002.40
Germany	101,074.00
Hungary	6,249.00
Romania	11,163.60
Slovakia	4,730.00
Slovenia	3,514.20

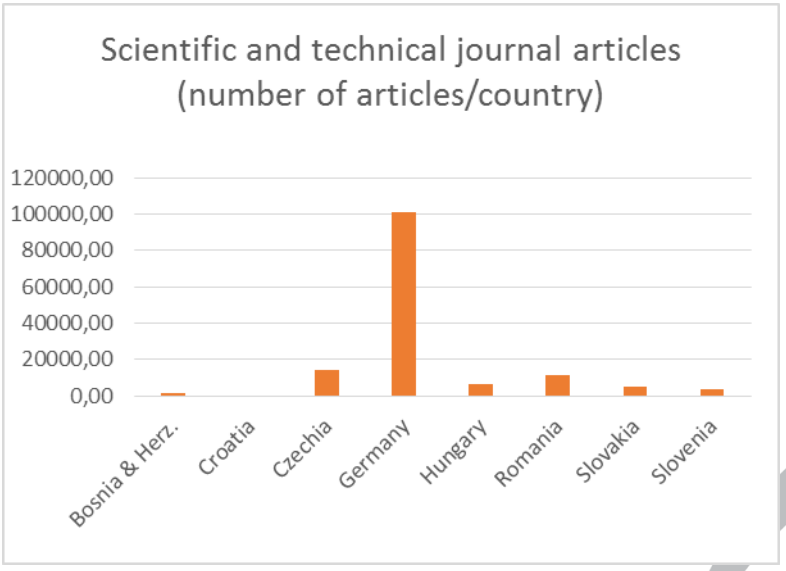


Table 7 and Chart 7: ADRSE construction, using data provided by partners

Even if Germany took the third place in „R&D researchers & technicians" categories, it has the first place (unrivaled) in both „Patent applications" and „Scientific and technical journal articles". In „Patent applications", the second place is taken by Romania and the third place is occupied by Czechia. In „Scientific and technical journal articles", the second place is taken by Czechia and the third place is occupied by Romania.

1.2 Processed data

	Bosnia & Herz.	Croatia	Czechia	Germany	Hungary	Romania	Slovakia	Slovenia
R&D intensity	8th	6th	3rd	1st	4th	7th	5th	2nd
R&D expenditure	8th	6th	7th	1st	2nd	5th	3rd	4th
Researchers in R&D	8th	6th	2nd	3rd	4th	7th	5th	1st
Technicians in R&D	6th	5th	2nd	3rd	4th	8th	7th	1st
Patent application	8th	7th	3rd	1st	4th	2nd	6th	5th
Scientific & tehnical articles	7th	8th	2nd	1st	4th	3rd	5th	7th
Indicators conclusion	Lowest amount of money + very low number of researchers & technicians = the worst results	Low amount of money + low number of researchers & technicians = the worst results	Low amount of money + very good number of researchers & technicians = good results	Highest amount of money + good number of researchers & technicians = the best results	Good amount of money + medium number of researchers & technicians = medium results	Low amount of money + lowest number of researchers & technicians = good results	Medium amount of money + low number of researchers & technicians = low results	Good amount of money + highest number of researchers & technicians = low results

Table 8: ADRSE construction, processing data provided by partners

2. Special features of the innovation environment of the Danube Region

2.1 Introduction

2.1.1 Horizontal

Historical fluency and discrepancy

RRI is still a relatively new concept for countries in South East Europe and in the Danube region. In these countries, the **innovation environment is relatively underdeveloped compared to Western countries** (European and American).

The core operational document of the Danube Transnational Program emphasizes the following **features of the region** (EC 2014c): low level of economic development; dominance of the SMEs; challenges of exploiting the potentials; relatively low level of employment rate; diversity of culture; diversity in population density; challenges of migration: from rural to urban areas; from the East to the West; high administrative fragmentation; a large variety of bio geographical features.

Another important feature of the Danube countries is that the majority of them had **relatively strong relationship with the Soviet Union**, making these countries really different from the Western countries.

Before the 90`s. Western European countries increased their expenditure on R&D, while the Eastern European countries insisted on autarky and did not keep the pace with global technological changes (Krammer, 2007). During the planned economy, innovation was hindered: market demand was centrally influenced, and owing to the central price rules, the price of a new product was so low that it would not have covered the research and innovation expenditures. As a result, companies were not interested in research and development activities. In addition, innovation processes were really fragmented: in order to implement innovation, significant inter-organizational cooperation was needed but the interests of organizations overwrote the cooperation between researchers and engineers.

After the 90`s. At the time of political transformation, research and development policies were again in the background (Carayannis and Egorov, 1999). As a result, these countries have less developed innovation environment and they rely more on external knowledge flow than internal knowledge creation (Inzelt and Szerb, 2006; EC 2014b). In addition, even though there was democratization in these countries, transition could not change the trust of peoples towards each other (EC 2014b).

Current situation. In the old member states, innovation facilities (such as science parks, technology transfer institutions, etc.) help implement innovation strategies, but in the new

member states these facilities were established only in the previous 10-15 years and their regional distribution is still uneven: these facilities are concentrated around capital and larger cities (EC 2012). Gross Domestic Expenditure on R&D (GERD) is generally lower in the SEE countries in comparison with the EU average. The performance of the SEE countries in terms of Business Sector Expenditure on R&D (BERD) is relatively low in comparison with other EU members.

Some progress can be observed concerning the adoption of educational and research system in the less favored countries. SEE countries appear to experience a structural change underlined by the ongoing upgrading of their economic structures and knowledge intensity of their economies over the last decade (EC 2014a). In most SEE countries, universities and science centres are usually concentrated in major urban areas and/or the regional economic centres (EU 2012). Generally, the share of higher education expenditure on R&D (HERD) of GDP is still relatively low in SEE countries compared to EU15.

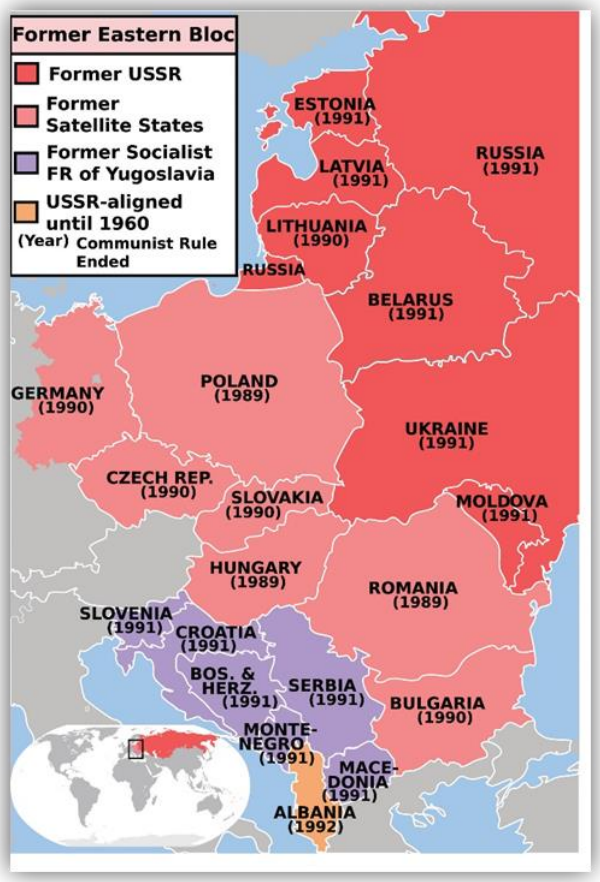
Besides, over the past twenty years, the number of researchers and scientists in the SEE countries has seriously decreased, because highly educated people leave their home countries in search of a better life. Experts leave their country for better professional fulfillment abroad ("external" brain drain), or they leave their professions for better-paid jobs in the private sector ("internal" brain drain) (UNESCO 2009; Stankovic et al. 2013).

"The uneven distribution of research and innovation capital is mainly due to the different framework conditions the sector is facing throughout the region. The wide range of financial allocations and policies governing the research sector are determining the institutional capacities of the actors involved, leading to different levels of performance." (EC 2014c, p. 13).

However, though **substantial reforms of existing institutions have been introduced**, the significant role of informal and indirect relationship between stakeholders, a high level of corruption and political influence on innovation activities still exist in these countries.

A number of new institutions have been set up in order to diversify current education systems, promoting research and development and the diffusion of innovation.

Although these reforms have not always been quick and complete, as discrepancies frequently arise between the adoption of new legislation and its implementation, progress achieved so far across the SEE countries can be considered adequate.



SEE countries still face specific problems that influence the decision-making process and action planning, for example, the lack of inter-sectoral cooperation between ministries responsible for higher education, research and innovation, the traditional organization of universities or the lack of a university development strategy (UNESCO 2009).

The difference between the innovation environment in SEE countries and those in more developed areas of the European Union, makes us assume that **in the SEE countries, responsible innovation should be handled in a different way** – including definition, application, implementation, and practical acceptance.

> *Communism has never come to power in a country that was not disrupted by war or corruption, or both (John F. Kennedy)*

2.1.2 Vertical

Common issues in the Danube region

- **Universities and science centres are concentrated** in major urban areas and/or regional economic centres. Universities, however, also belong to smaller, rural regions, the only difference is that these institutions mostly focus on education rather than research and innovation.
- **The number of researchers and scientists has seriously decreased**, therefore this phenomenon became a highlighted problem. The decrease was mainly caused by the lack of career incentives, access to scientific equipment and information, current economic situations, political issues, complicated administration, as well as low salaries. Under these conditions, the brain drain had a strong impact on RDI human resources.

- The role of **informal relationship between stakeholders** is sometimes much more important than the official ways of being in contact**;** informal relationship is much faster. Furthermore, the role of trust is significant via informal relations, which reduces the bureaucratic burden. Informal relationship is more important than the official way.
- **The high level of corruption** is a serious problem, additionally, a risk for businesses. In the public sector, corruption is usually more frequent than in the private sector, especially in case of big public procurements. Operation of policy is often linked with corrupt practices in the public opinion, thus people do not trust each other.
- The **political influence** on innovation activities is present in most of the countries. When innovation activities are done by using their own sources in response to the market demand, there is no political influence. In case of grant-driven innovation, however, the presence of this issue is significant.
- **The level of trust is low**, except for Germany. Generally, there is a serious lack of public trust in the government. The poor transfer of technology, the low level of information sharing and cooperation results in a serious problem in the R&D sector. Besides institutional trust, trust in other people and in business is also problematic. In many cases, the inefficient innovation system led to this situation. On the contrary, the level of trust is relatively high in Germany, because of the incorrupt environment.
- **The lack of cooperation willingness** is present in most of the countries, except Germany. The lack of cooperation between universities and the business sector, and between the public and private sector is mainly caused by the low level of trust in most of the countries. In general, poor transfer of knowledge and low level of information sharing as well as cooperation are severe problems of the R&D sector.
- **The role of governmental financial support** in stimulating innovation activities is sometimes higher than the market-driven innovation. Governmental financial support is essential, because of the companies' severe lack of sources. They do not have high innovation capacities; consequently, their market-driven innovation activity is usually limited.

Between major countries, there certainly always are some common ground and points of tension (Vladimir Putin)

2.2 SWOT analysis

2.2.1 Foursquare

	STRENGTHS
Bosnia & Herz.	RRI applicable in all sectors and fields; Strategic orientation to RRI; Sectoral approach to innovation; Initiatives of innovation development.
Croatia	Reform in R&I framework in 2013; adopted Strategic documents in national education and R&I systems; rationalization and connecting of the offices for EU projects in various ministries; Tradition in research within big industrial complexes.
Czechia	Modern facilities and equipment thanks to EU funds; Long experience in many disciplines of sciences, good HR capacity and expertise of research teams; ELI infrastructure; Good society and policy attitude towards R&D; Lower cost of R&D work and services; EU and national budget for cooperation; The first national programme Zéta (Technology Agency of the Czech Republic) is focused on a gender equality in research teams.
Germany	Powerful economy and low unemployment rates; Universities, research institutes and the business sector are developing high-quality technologies, processes, services and innovative products, which can then also be produced and applied locally on the basis of well-qualified employees and the narrow network of companies; Research-intensive economy; Dense network of universities, non-university and research institutes invest large amounts in the production of knowledge.
Hungary	The project team dealing with RRI from the FHRIA; some hubs and institutions dealing with RRI (growing number of RRI experts); pilot projects that were conducted on practical implementation of RRI; the closed projects (FaRinn).
Romania	Dedicated national structure for research and innovation – Ministry of Research and Innovation; Special chapter for innovation and SMEs in strategy and planning documents; Statistical targets for SMEs and Innovation; Allocation of funds on a competitive basis with evaluations made by scientists from abroad; New public procurements rules aiming at avoiding corruption.
Slovakia	Good research infrastructure; Increasing number of researchers; Willingness to cooperate on academic level; Cheap working force; Good complimentary horizontal infrastructure – life sciences, robotics, nanomaterials and ICT; Tradition in some fields of industry that is connected to R&I; Good ethical strategy at university level; Good international networks.
Slovenia	RD activity in business sector; R&D capacity and potential in the public sector; Involvement of stakeholders in international vale chains and networks; intensive RDI policy and a stimulating tax environment for RDI; high quality living and working environment, and resources for the transition to green economy; Number of international scientific co-publications, new doctorate graduates, and public-private co-publications.

Table 9: ADRSE construction, processing / resuming data provided by partners

Continuous effort -not strength or intelligence- is the key to unlocking the potential (Winston Churchill)

	WEAKNESSES
Bosnia & Herz.	Not enough funds for innovation (for academic sector); Funds for SMEs are at low level; Complicated state organisation (5 levels-district); No statistical data.
Croatia	Low level of R&I funding; Low absorption of the ESIF; Lack of coherent and integrated R&I policy framework; low cooperation within scientific community; fragmented / dissipated / uncoordinated R&I institutes (universities, centres etc.); lack of coordination between responsible Government bodies; lack of coordination in design of support instruments for innovation and access to finance.
Czechia	Rigid system of leadership and administration; Small scale of R&D system; lack of internationalization; Different attitudes towards new R&D evaluation (Academy of Sciences, universities) -> no agreement, no progress; Brain drain to abroad; low awareness of the RRI method. Cooperation between research organizations and businesses is low; No examples of good practice in the implementation of RRI in practice.
Germany	Technology transfer; Corporate networking; Creating strong links between research institutions and SMEs; Lack of young professionals; Product-market-fit.
Hungary	Lack of cooperation between innovation actors; lack of trust; low knowledge about RRI; low number of RRI experts; low number of scientific publication dealing with RRI; researchers refuse to cooperate.
Romania	Frequent changes in administration of research and innovation and in legislation; Low and unpredictable funding; the lowest number of researchers per million inhabitants in the EU; The lowest number of patents; Survival culture in R&D funding; brain drain starting from high school; The quality of training in some universities; Public procurement rules too complicated and time consuming.
Slovakia	Low quality of institutions (policy); Brain Drain; Limited support from government; Lack of supportive environment (limited TT, incubators, etc.); Lack of finances for R&I; High administrative burden on researchers – complicated reporting, public procurement, etc; Most of researchers are followers not leaders; underdeveloped R&I system; lack of drive to achieve; Limited know-how in methodology, project writing, laboratory management, etc.
Slovenia	Public expenditure for RDA; significant gap between R&D expenditure of the public and business sector; RDI management model; Low level of internationalisation; weak cooperation; absence of systematic incentives within knowledge institutions; Weak and unstable institutional capacity of the state, excessive bureaucratisation of procedures and non-supportive tax environment for entrepreneurship; Taxation system is preventing high awards – labour taxes are too high and do not stimulate employers to award the best workers with high salaries or bonuses.

Table 10: ADRSE construction, processing / resuming data provided by partners

Power over others is weakness disguised as strength (Eckhart Tolle)

	OPPORTUNITIES
Bosnia & Herz.	RRI can encourage the pursuit of knowledge and innovation in all fields; Experience in innovation labs; Universities and researchers can be more oriented in science (to minimise political influence); To participate in EU programmes and projects; Educational system is wide; Economy of knowledge can be applied.
Croatia	Governmental grant schemes and instruments to support business R&I investment; Access to ESI funds; Horizon 2020 and other EU programs; New legislative framework for R&D tax incentives to the business sector.
Czechia	Good geographical location in context of Danube region – most western country; EU funds till 2020 – the unique possibility to get funding for all stages of R&D; Private sector will need R&D services to remain competitive in the EU market; Sharing of experience in Danube region; The RRI concept is unknown among companies, publicity in this area is weak; Most stakeholders state that they perceive RRI as one of the R & D challenges.
Germany	Identification of measures that enable more SMEs to be integrated into the innovation process and to further increase the innovation activities of medium-sized enterprises; Entire value chain could be present from research and development to production in the country.
Hungary	EU funds; high quality of education; Specific call for proposals on innovation are available D-STIR; Growing knowledge of the consumers; fast flow of information; globalization.
Romania	Implementation of beyond the state of the art European RI, is an appropriate location for implementing RRI and an incentive to comply with EU standards and rules; Increased participation in EU projects; Increasing awareness of simplification possibilities proved by EU funding programmes that can be used as examples for national funding.
Slovakia	Structural funds (ERDF) for R&I – mainly for infrastructure not research itself; know-how through EU projects; Improving R&I ecosystem according to western model also through RRI; Possibility to change mind sets of R&I stakeholders.
Slovenia	Reorganization of international value chains and new industrial revolution – opportunities to establish a stronger position within higher level value added (VA) value chains.

Table 11: ADRSE construction, processing / resuming data provided by partners

Failure is simply the opportunity to begin again, this time more intelligently (Henry Ford)

	THREATS
Bosnia & Herz.	Political instability; Economic and social situation; Investing in R&I; Bureaucracy.
Croatia	National target of R&D intensity - 1.4% of GDP - until 2020 will not be achieved; No progress in technological development; Products of low added value instead of knowledge-based economy; Croatian economy lags behind the European Union.
Czechia	Bureaucracy of R&D funding scheme; End of EU fund 2020 period; Political changes and influence on financing; Changes in grant scheme and administration rules; Outflow of private capital and big companies to lower cost countries; Absence of social aspects in the R&I life. The main issues of R & D & I in particular of RRI are financing R & D & I, human capital and R & D & I evaluation.
Germany	General modernization and innovation pressure; Without targeted countermeasures in the area of skilled labour recruitment, the demographic development would contribute to a massive intensification; Continuous intensification of the global innovation competition.
Hungary	Centralization – large cities; bad infrastructure; negative brain drain effect; underfinancing environment; RRI policy is missing from the innovation policy; low interest of business sector in RRI.
Romania	Persistence of low and unpredictable funding; Permanent resistance to changing the RDI system; Unprofessional reform of RDI or continuing absence of any reform; Low influence on decision makers in order to transform weaknesses in opportunities and opportunities in strengths.
Slovakia	Unwillingness to cooperate on both broad quadruple helix and small laboratory level; Not acceptance of RRI by stakeholders.
Slovenia	Brain drain, in particular of educated young people; Perception of Slovenia as a peripheral, non-competitive and rigid country which is investment –and talent-unfriendly; Educational system is not supporting “out of the box” thinking and not enough time and support is devoted to encourage young people to nourish their creative and innovative potential.

Table 12: ADRSE construction, processing / resuming data provided by partners

The single biggest existential threat that's out there, I think, is cyber (Michael Mullen)

2.2.2 Cross-cut

	Bosnia & Herz.	Croatia	Czechia	Germany	Hungary	Romania	Slovakia	Slovenia
S	Strategic orientation to RRI	Reform in R&I framework in 2013	Modern facilities & equipment (EU funds)	Powerful economy	growing number of RRI experts	National structure for R&I	Good research infrastructure	RD activity in business sector
	Sectoral approach to innovation	EU projects officers in ministries	good HR capacity and expertise	high-quality technologies	existing RRI pilot projects	dedicated planning documents	cooperation on academic level	stakeholders, chains and networks
	Initiatives of innovation development	Tradition in research	Lower cost of R&D work and services	Research-intensive economy	RRI hubs and institutions	New public procurements rules	Cheap working force	living and working environment
W	lack of funds for innovation	Low level of R&I funding	Rigid system of administration	Technology transfer	Low scientific cooperation	administration instability	Low quality institutions (policy)	weak cooperation
	lack of funds for SMEs	Low ESIF absorption	Small scale of R&D system	Corporate networking	low number of RRI experts	bureaucracy	limited TT, incubators	bureaucracy
	No statistical data	low scientific cooperation	Brain drain	Lack of young professionals	lack of trust	Brain drain	Brain drain	Tax system
O	Experience in innovation labs	Governmental grant schemes	geographical location	integrate innovation	high quality education	state of the art European RI	R&I infrastructure	industrial revolution
	EU funds	EU funds	EU funds	developed value chains	EU funds	EU funds	EU funds	developed value chains
	Educational system	legislative R&D framework	Danube sharing experience	medium-sized enterprises	fast flow of information	incentive to comply with EU standards	Stakeholders awareness	economic opportunity
T	Political instability	national target not achieved	Bureaucracy of R&D funding	innovation pressure	Centralization	unpredictable funding	Unwillingness to cooperate	country perception
	Economic and social situation	low added value	End of EU fund 2020 period	demographic development	underfinancing environment	Unprofessional reform of RDI	low interested stakeholders	no “out of the box” thinking
	Bureaucracy	Economy	Political changes	global competition	Brain drain	resistance to change		Brain drain

Table 13: ADRSE construction, processing / resuming data provided by partners

3. RRI in innovation documents

3.1 Term(s) of RRI

Responsible research and innovation, dubbed RRI, it is part of on-going reflection on changing governance relations between research, innovation, and wider society. RRI it has been addressed systematically beyond its origins in the philosophy of science by several academic fields and from several points of view. Specifically, it has been covered under the terms responsible development, research integrity, technology assessment, anticipatory governance, public engagement in science, ELSI *(Ethical, Legal and Social Implications of science)* and ELSA *(Ethical, Legal and Social Aspects of science)* to name a few.

Most recently, it has also begun to form bridges and connections with other literatures coming from different directions such as corporate social responsibility, responsible innovation including steering towards societal challenges, responsible industry and innovation systems.

Policy plays such a multifarious role in innovation, it is not sufficient to merely "adapt" to trends and developments, because policy and regulations are among the factors that determine the innovation dynamics and the chances of survival of innovations (Pol Maclaine Pont, Rinie van Est, Jasper Deuten, Shaping socio-technical innovation through policy).

Framework key:

1. Public engagement.
2. Gender equality.
3. Science education.
4. Open access.
5. Ethics
6. Governance.

3.2 Implementation

	National R&I strategies & policies
Bosnia & Herz.	THE FRAMEWORK LAW ON HIGHER EDUCATION; THE FRAMEWORK LAW ON SCIENCE; THE FRAMEWORK LAW ON SCIENTIFIC AND RESEARCH OPERATIONS AND COORDINATION OF THE INTER-ENTITY AND INTERNATIONAL SCIENTIFIC AND TECHNICAL COOPERATION
Croatia	STRATEGY FOR EDUCATION, SCIENCE AND TECHNOLOGY; STRATEGY FOR FOSTERING INNOVATION 2014-2020; SMART SPECIALIZATION STRATEGY 2016-2020; INDUSTRIAL STRATEGY 2014.-2020; CROATIAN RESEARCH AND INNOVATION INFRASTRUCTURES ROADMAP; STRATEGY FOR CLUSTER DEVELOPMENT 2011-2020
Czechia	THE NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION POLICY OF THE CZECH REPUBLIC 2016-2020; THE NATIONAL PRIORITIES OF ORIENTED RESEARCH, EXPERIMENTAL DEVELOPMENT AND INNOVATIONS; THE NATIONAL RESEARCH AND INNOVATION STRATEGY FOR SMART SPECIALIZATION
Germany	THE FEDERAL GOVERNMENT'S HIGH-TECH STRATEGY; THE INNOVATIVE STRATEGIES OF THE 16 GERMAN FEDERAL STATES ARE LINKED TO THIS HIGH-TECH STRATEGY OF THE FEDERAL GOVERNMENT AND ITS PRIORITY TASKS AT NATIONAL LEVEL
Hungary	SPATIAL DEVELOPMENT PROGRAMME OF CSONGRÁD COUNTY 2014; SMART SPECIALIZATION STRATEGY (S3 STRATEGY); ECONOMIC DEVELOPMENT AND INNOVATION OPERATIONAL PROGRAMME
Romania	THE NATIONAL STRATEGY FOR RESEARCH, DEVELOPMENT AND INNOVATION 2014 - 2020; NATIONAL R&D PLAN AND INNOVATION; NATIONAL STRATEGY FOR COMPETITIVENESS (NSC); NATIONAL REFORM PROGRAMME 2016; REGIONAL OPERATIONAL PROGRAMME 2014-2020; REGIONAL DEVELOPMENT STRATEGY FOR THE SOUTH-EAST REGION OF ROMANIA
Slovakia	NATIONAL REGIONAL INNOVATION STRATEGY RIS3; ACT 172/2005 REGULATES 10 NATIONAL RESEARCH AND DEVELOPMENT PROGRAMS IN ACCORDANCE WITH THE PRIORITIES OF THE STATE SCIENCE AND TECHNOLOGY POLICY WERE APPROVED BY THE GOVERNMENT; ACT 185/2009 ON INCENTIVES FOR RESEARCH AND DEVELOPMENT
Slovenia	OPERATIONAL PROGRAMME FOR THE IMPLEMENTATION OF THE EU COHISION POLICY IN THE PERIOD 2014-2020; 2SLOVENIAN INDUSTRIAL POLICY - SIP; RESOLUTION ON RESEARCH AND INNOVATION STRATEGY OF SLOVENIA 2011-2020; 4. SLOVENIAN'S SMART SPECIALIZATION STRATEGY – S4

Table 14: ADRSE construction, processing / resuming data provided by partners

In most of the countries, the term RRI is not present directly (as a well-defined concept) in the strategic documents. However, several RRI key topics are present in the national / regional strategies of R&D. Furthermore, the sustainable-ecologically responsible approach is an European current trend, together with the openness to society challenges like gender, social disparities etc. Some direct approach was found in Hungarian and Slovenian documents.

Laws are never as effective as habits (Adlai Stevenson)

4. RRI in business environment of the Danube region

4.1 Introduction

In the course of discussing the topic of Responsible Research and Innovation (RRI), we shall keep in mind that the academic sphere has different characteristics than the business sphere. These different characteristics affect to a great extent how successfully we can put the conception of the RRI into practice. Until now a meaningful part of the enquiries and the practices focused on the academic sphere – in this milieu, significant results were recorded in the literature.

On the other hand, the relation between the business sphere and the RRI is not as well-known as the above-mentioned relation. The disposable information is insufficient about how successfully we can introduce the RRI to the business sector. We make an attempt to synthetise the issues of those part of the literature that give details about the adaptability of the RRI in the business sector. Our aim is to gain a deeper understanding about why the relation between the RRI and the business sphere is so specific.

Nowadays, most innovations are carried out by private sector, meanwhile, research is concentrated in academic R&D environments. This tendency may cause many tensions in the near future. Companies are responsible in different ways and for different things. On the one hand, they have legal responsibilities and contractual responsibilities, on the other hand, they have to meet their stakeholders', costumers' and employees' expectations, as well (Iatridis and Schoereder, 2015).

Due to the unfavourable possible impacts of new discoveries, policy makers have to influence this process to achieve innovation outcomes which are sustainable, societal desirable and ethical acceptable.

4.2 Identification of RRI

First of all, there is a need to define responsible innovation. Many determinations are existing, but there are a few which could circumscribe it precisely. Von Schomberg defines responsible innovation as a 'transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (Von Schomberg, 2013, p. 19).

Waldman and Galvin (2008) for instance claim that responsible leaders combine economic orientations with an extended stakeholder orientation. According to Blok and Lemmens (2015), the main problem is in connection with short-term purposes and long-term purposes. Companies focus on

strict cost-benefits analyses for short term, while they tempt to disregard respect to responsibility in long term.

Breakthrough innovations could have considerable risks and uncertainties, which affect the overall society and innovators, as well. George Moore (1991) draws attention the role of markets, because there is a huge disagreement between early adopters and wider stakeholders. Insiders and early adopters appreciate new technologies development, while mainstream markets and wider stakeholders have a strong interest in only benefits.

Wider stakeholders and mainstream markets become stronger to influence the final success of the innovation when it is introduced in larger markets.

4.3 The theory of moral competencies

In the field of corporate sustainability there are two new and unknown moral competencies which define this area: normative competence and action competence. On the one hand, fixed values and principles are laid down to assess and improve the sustainability of social-ecological systems by normative competence.

On the other hand, action competence means the "capability to involve yourself as a person with other persons in responsible actions and counter-actions for a more humane world" (Schnack, 1996: p15).

Both notions are considered as moral competence, because they contain norms, values and beliefs which define what is right and wrong concerning sustainability. But there is a huge difference between meaning of normative and action competence.

In the case of normative competence, actors can be held responsible for sustainability, while in the second case, actors can take responsibility for it. Sustainability is often called as wicked problem, because it concerns global problem as climate change or poverty, cannot be solved by simple solutions and may cause uncertain effects.

Moreover, involved stakeholders have different opinion about what is the "real" problem and how it can be solved, so professionals are not able to take the "right decision" and to behave in a responsible way in every case (cf. Rittel and Webber 1973; Peterson 2009). In addition, there is a tension between both competencies, as universal norms emphasize the universality of ethical judgments, while action competence highlights the singularity of ethical decision making processes (cf. Ellis and Weekes 2008; Jensen and Schnack 1997).

4.4 Controversial issue

According to Doris Schroeder and Konstantinos Iatridis, company's stakeholders' expectations (to maximise their wealth) not allow to meet the criteria of natural environment responsibility and societal responsibility at the same time.

Thus the most serious and urgent problems with corporate responsibility are: it is unclear and controversial, there is not sufficient practical relevant for companies and last but not least, it could not be implemented because of its complexity. The authors suggest a new field (Responsible Research and Innovation) instead of existing tools (corporate responsibility) which could solve these problems.

Firstly, there is a need to gather increasing interest and to enhance its practical relevant. Responsible Research and Innovation does not aim to create new concept, because it is built on the existing knowledge such as technology ethics, technology assessment, science and technology studies, and research policy.

However, it has to shape, maintain, develop and coordinate existing responsibilities. The central problem is the significant proportion of RRI focuses on activities which are carried out by universities an public research organizations, but outcomes which are undertaken by private sector have more immediate impacts on end users.

In addition, the authors provide technical assistance in connection with implementation of RRI. They clarify the fundamental and already exist corporate responsibilities and show how these tools can be used for the purposes of RRI.

Thanks to it, decision-makers could adopt RRI and accept the higher-level responsibility of ensuring that their research and innovation activities are consistent. Moreover, balance between own goals of businesses and the greater good of society can be maintained by Responsible Research and Innovation, as well.

4.5 Reverse logistics model

Maric, Rodhain and Barlette, the three French researcher are also drawing attention to importance of Responsible Research and Innovation, thus there is a huge gap between academic goals and business goals.

Companies are tempted to disregard social and environmental impacts of new development, while universities do not focus on the exploitation of technology in commercial markets, they only try to achieve scientific perfection without profit interest. The authors provide a new solution (reverse

logistics model) to business sector in order to maintain their profitability and responsibility at the same time.

This issue is receiving ever-increasing attention from the world, so many programmes and conferences are held, therefore it possesses its own Journal of Responsible Innovation, which is based on American efforts and linking with Arizona State University.

Firstly, we should define the notion of innovation at all. It is the process of making changes to something established by introducing something new, which means *"creative destruction"* according to Schumpeter (1912).

It can contribute to develop products, services, processes and organizations, therefore can occur at all levels in an organization, from management teams to departments and even to the level of the individual (O'Sullivan et al., 2009).

Researchers and innovators cannot predict the possible negative effects, so distrust is legitimated towards innovation of business sector, because during past several decades, many cases prove that they were not always responsible, in order to enhance stakeholders' values and meet the profit criteria.

Responsible innovation should be contained the mark of voluntary by the companies, which could create economic, social and environmental values, moreover contributes to well-being of individuals and society (Ingham, 2011).

However, it is evident that business need to innovate in order to survive this tight competition and remain profitability in market economy. But there are three factors which could question to be developed in response to consumer needs, monitoring and managing direct impacts of innovation and considering the indirect consequences of innovation (European Network for Responsible Innovation, 2014).

The authors draw attention a new solution, which is based on reverse logistics model. This conception highlights the role of recycling and reusing. In a nutshell, it is a process in which manufacturer manages product return for possible reuse, recycling (Keh et al. 2012).

This approach can cause environmental and social benefits, as well. On the one hand, it can create and preserve jobs, on the other hand, resource consumption is reduced, it contributes to a sustainable environment and complies the environmental legislations. Last but not least, economic point of view, it results reduced expenses and enhanced revenue.

4.6 Different Attempts to represent the Space of RRI Graphically

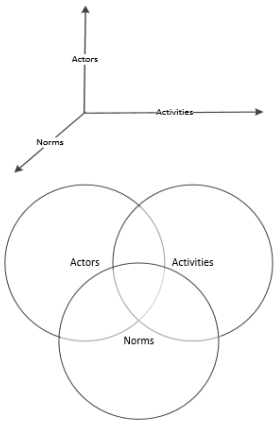


Figure 1: Different Attempts to represent the Space of RRI Graphically, Source: Stahl (2013)

In the first graph (Stahl, 2013), divergent directions of Actors, Activities and Norms are illustrated in the space. Although, the starting point is the same, which means the subject of innovation, the different factors may follow different aims, if there are not common values. As a conclusion, the second figure is represented as a set, where the role of cross section is emphasized. Firstly, there is a need to shed light on the relevant **actors** in innovation process, who represent different values. These stakeholders – just to name a few – are policy-makers, professional bodies, legislators, research funders, individual researchers, research organizations (both publicly and privately funded), educational organizations, industry, users of research and innovation, research ethics committees and civil society actors at different levels. The main challenge is aligning their existing expectations, needs and values to a desirable technology outcome. RRI actors try to influence the world of science to apply for better aligning their needs and values, moreover they make steps to develop existing RRI governance practices and they perceive plausible regulatory gaps, as well. In spite of the wide range of these **activities**, European Commission has suggested five action lines, which addressed as central policy priorities for RRI.

This guideline includes the following priorities:

1. better engagement of citizens to science
2. enhanced presence of women in science
3. improved science literacy and education of all Europeans
4. open access to scientific results
5. better aligned, responsible and more efficient governance of science

In order to enhance the responsibility, R&I projects need to be assessed if they are socially and ethically desirable and acceptable. Among these assessing possibilities, we should highlight risk assessment, impacts assessment, and technology assessment. Furthermore, there is a need to examine the possible future impacts, which can be carried out by future studies and foresight research. Moreover, we should define values, which promote the whole innovation system to create desirable technical outcomes. These **values and norms** must contain the mark of the social, cultural, economic and environmental benefits. Some of the central aims can be an improved quality of life and a reduction of the number of people living in poverty, an increased employment rate, respect for fundamental rights and sustainable development.

4.7 Characteristic of industry

Industry does not behave during the implementation of research as other actors do, due to the different industrial features. Although, they have to ensure positive impacts of technology and provide higher-level responsibility for their stakeholders, in practice they try to reduce the regulatory gaps, obtain appropriate knowledge on the consequences of the outcomes of R&I and maintain their profitability.

Researchers have only recently focus on how RRI principles might be implemented in industry and there is a few information about their practice. To understand how RRI principles could integrate into industrial level, it is necessary to take into account awareness of RRI-related issues and convince industry to implement RRI, as well. The main challenge is identifying the necessary implementing tools within RRI context, because mainly corporate social responsibility (CSR) tools have been developed yet (Yaghmaei, 2015.

4.8 Conclusion

It is very important to highlight – because it fundamentally determines the attitude of the business sphere about the RRI – that in many cases the motivation, which is related to the R+D+I activities of the academic sphere differs from the motivation of the R+D+I activities of the business sector. In case of the business sector, the primary motivation for a company is to enter to the market with a new product before the competitors.

With this action, the company could easily acquire competitive advantage while realizing profit. In such a taut situation and under pressure, the fast reactions are very important, as well as the innovation output by itself, which is completely out of accord with the aspects of RRI. If a company use

the RRI, it could bring verdicts based on RRI – which the company otherwise would not bring without the existence of RRI. In addition to this, these decisions ease up the R+D+I processes or simply bolster up the decision to stop the entire process.

Without the RRI, it would not exist. Within the academic sphere, this kind of motivation generally appears only in case of research cooperation with the business sector, but in most cases neither the margin pressure nor the market pressure are the main motivations of the R+D+I activities.

This kind of academic milieu provides better conditions for the RRI, because there is enough time to take into consideration the impacts, and there are much more opportunities to bring verdicts than in the business sphere. The above-mentioned ones are proved by the followings as well: the academic sphere deals with activities from the beginning of the innovation value chain (Technology Readiness Level – first three levels), while the companies deal with activities from the end of the innovation value chain (TRL last three levels).

	Business	**Academic**
Motivation of R&D&I	realise competitive advantage on the market	scientific success in early stages/ cooperation with the business sector in later stages
Main goal	very quick introduction to the market	scientific perfection
Main target group	customer	scientific community, business sector
Dominant phase of the innovation chain	later phase	early phase
Dominant type of R&D	Experimental development	Basic research and applied research
Dominant TRL (technology readiness level)	TRL7-9	TRL1-6
Profit criteria	very important	not significant
Motivation on considering RRI issues during the R&D&I activity	very limited (marketing reasons and mandatory reasons)	yes
Interest on medium and long term negative side effects of R&D&I activity	less	more
Financial disadvantage from implementing RRI	may happen (cancelling the market introduction of a “risky” product – missing profit)	no
Interest on implementing RRI	less	more

Table 15: RRI and its influencing factors in the two main innovative sectors, construction by EMFIE

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